

REMARKS

Response to Election/Restrictions

In the May 5, 2005 Office Action, the Examiner stated that claims 42-59¹ are withdrawn from further consideration as drawn to a nonelected group of species, i.e., species 2 and 3, while there is no allowable generic or linking claim in the present application.

In response, Applicants have hereby added a new claim 60, which is a generic claim that links claims 29-59 of species 1, 2, and 3. Specifically, new claim 60 recites "one or more layers of materials selected from the group consisting of Si, SiGe, SiC, and SiGeC over said upper surface, wherein said one or more material layers comprise at least one layer of SiC or SiGeC." Such one or more material layers, as recited by claim 60, covers the SiC layer recited by claims 29-41 of species 1, the SiGeC layer recited by claims 42-54 of species 2, and the multitude of layers recited by claims 55-59 of species 3.

MPEP §809 provides that when one or more linking claims are present, "the linking claims must be examined with the invention elected, and should any linking claim be allowed, the restriction requirement must be withdrawn" and that "any claim(s) directed to the nonelected invention(s), previously withdrawn from consideration, ... must be rejoined and will be fully examined for patentability."

Applicants hereby expressly manifest the intention to rejoin claims 42-59, which are directed to the nonelected species 2 and 3, upon allowance of linking claim 60. Consistent with such an intention, Applicants have herein maintained claims 42-59 in the present application without cancellation and have amended claims 42-59, so as to present such claims in form and condition for rejoinder upon allowance of linking claim 60.

¹ It was erroneously stated in the May 5, 2005 Office Action that "[c]laims 1-28 and 42-59 have been withdrawn from further consideration... as being drawn to a nonelected group of Species (two and three)." In fact, claims 1-28 have already been cancelled in the Preliminary Amendment previously filed on February 13, 2004.

Response to the Objection to the Information Disclosure Statement

In response to the Examiner's request in the May 5, 2005 Office Action, Applicants enclose herewith copies of the Kanzawa and Kasper references.

Please note that the February 10, 2004 Information Disclosure Statement and PTO-1449 Form contain inadvertent typographic errors relating to the publication number and the name of the first inventor of the Kanzawa reference. The correct publication number for this reference is US 2002/0160605, and the correct name of the first inventor is Kanzawa.

Accordingly, a substitute IDS Form, which contains the correct publication number and inventor name of the Kanzawa reference, is enclosed herewith, and Applicants hereby request the Examiner to replace the February 10, 2004 PTO-1449 Form with this substitute IDS Form.

Response to the Objection to Drawings

In the May 5, 2005 Office Action, the Examiner objected to the drawings of the present application under 37 CFR §1.83(a), asserting the interface having an abrupt change in C concentration of more than 1×10^{13} atoms/cc over a layer thickness in the range from about 6Å to about 60Å as recited in claims 29-42 must be shown in the drawings (see Office Action, page 2, section 2).

In response, Applicants hereby direct the Examiner's attention to Figures 1 and 2, which shows alternative silicon-containing regions with high carbon concentrations (i.e., layers 24, 28, 32, 36, 40, and 44 in Figure 1, and layers 24', 28', 32', 36', 40', and 44' in Figure 2) and low carbon concentrations (i.e., layers 26, 30, 34, 38, and 42 in Figure 1 and layers 26', 30', 34', 38', and 42' in Figure 2). Such alternative silicon-containing regions define interfaces therebetween, which are clearly shown in Figures 1 and 2, where the C concentration changes abruptly from about 5.0×10^{13} atoms/cc to about 5.0×10^{23} atoms/cc within a depth of less than 0.1 micron (as shown in Figure 1), which is equivalent to a C

concentration changing rate of more than about 2.9×10^{13} atoms/cc for a layer thickness of about 6Å and of about 29×10^{12} atoms/cc for a layer thickness of about 60Å.

Therefore, the drawings of the present invention already show the interfaces having abrupt changes in C concentration, as specified in claims 29-42, consistent with the requirements of 37 CFR §1.83(a).

Although such interfaces are not specifically assigned any reference numerals in Figures 1 and 2, nothing in 37 CFR §1.83(a) requires the drawings to assign reference numerals to every feature of the invention specified in the claims, and a person ordinarily skilled in the art can readily determine the respective positions and the respective carbon concentration changing rates of such interfaces from Figures 1 and 2.

Accordingly, Applicants hereby request the Examiner to reconsider, and upon reconsideration to withdraw, the objections to the drawings of the present application.

Response to Rejections of the Specification and Claims 29-41

In the May 5, 2005 Office Action, the Examiner rejected the instant specification and claims 29-41, asserting that the specification fails to describe or provides antecedent basis for interfaces having an abrupt change in C concentration of more than 1×10^{18} atoms/cc over a layer thickness in the range from about 6Å to about 60Å.

In response, Applicants have hereby amended the specification, by adding descriptions for such interfaces. The amended specification therefore provides proper antecedent basis for such interfaces, as recited by claims 29-41.

Further, in response to the Examiner's rejections of claims 33, 35, 36, and 40 for lack of antecedent basis for the phrase "said p-type dopant profile," Applicants have correspondingly amended such claims, by removing the phrase "said p-type dopant profile."

Therefore, claims 29-41 as amended herein overcome the Examiner's rejections.

Response to §103(a) Rejections of Claims 29-32

In the May 5, 2005 Office Action, the Examiner rejected claims 29-32 under 35 USC §103(a) for alleged obviousness over Swanson et al. U.S. Patent No. 6,552,375 (hereinafter "Swanson") in view of Shindo et al. U.S. Patent No. 6,137,120 (hereinafter "Shindo"), Tay et al. U.S. Patent No. 5,296,258 (hereinafter "Tay"), or Fang et al. U.S. Patent No. 6,114,745 (hereinafter "Fang").

Applicants hereby traverse the Examiner's rejections of claims 29-32, for the following reasons:

The amended claim 29, from which claims 30-32 depend, expressly recites:

- "29. A layered structure comprising:
 a substrate having an upper surface of single crystalline Si, and
 a layer of SiC over said upper surface,
 said SiC layer and said upper surface of single crystalline Si define
 an interface having an abrupt change in C concentration of more than 1×10^{18} atoms/cc over a layer thickness in the range from about 6 Å to about 60 Å,
 and wherein the oxygen in said SiC layer is less than 1×10^{17} atoms/cc."

In contrast, nothing in the primary reference, i.e., Swanson, teaches or suggests formation of a SiC layer with an oxygen concentration of less than 1×10^{17} atoms/cm³.

More importantly, the instant specification describes on page 15, lines 10-14 that the carbon-containing silicon regions (i.e., SiC layers) 24, 28, 32, 36, 40, and 44 have an oxygen

concentration of less than 1×10^{17} atoms cm^{-3} and (ia) the low level of oxygen contamination is due to "the low initial base pressure in the deposition reactor and the choice of a precursor suitable for the heterogeneous growth process where the chemical reaction occurs on the growth surface." Specifically, before depositing the SiC films, the ultra-high vacuum chemical vapor deposition (UHV-CVD) system was pumped down to a base pressure below 10^{-8} Torr and preferably about 5×10^{-9} Torr (see instant specification, page 14, lines 3-5). Moreover, ethylene was chosen as the carbon precursor for the heterogeneous growth process (see instant specification, page 15, lines 15-17).

In contrast, the SiC layer disclosed by Swanson, i.e., layer 218 of Figure 2, was formed by a vapor phase epitaxy (VPE) process at a chamber pressure of about 10^{-20} Torr or at an atmospheric pressure of about 760 Torr, which is much higher than the base pressure required for forming the SiC film with an oxygen concentration of less than 1×10^{17} atoms cm^{-3} , as positively recited by claims 29-32. Further, the VPE process disclosed by Swanson uses a blocking material source gas, $\text{Si}_{1-x}\text{C}_x$, for forming the SiC layer 218, which is significantly different from the ethylene precursor used for forming the SiC layer in the claimed invention of the present application.

Therefore, the primary reference Swanson fails to provide any derivative basis for a SiC layer with less than 1×10^{17} atoms/cc oxygen. Nothing in the secondary references, Shindo, Tay and Fang, can remedy such deficiency of the Swanson reference.

Based on the foregoing, it is clear that claims 29-32 patentably distinguish over the cited references, by positively reciting a SiC layer with less than 1×10^{17} atoms/cc oxygen.

CONCLUSION

Based on the foregoing, claims 1-60, as amended/added herein and now pending in the application, are in form and condition for allowance. Issue of a Notice of Allowance for the application is therefore requested.

If any issues remain outstanding, incident to the formal allowance of the application, the Examiner is requested to contact the undersigned attorney at (516) 742-4343 to discuss same, in order that this application may be allowed and passed to issue at an early date.

Respectfully submitted,



Leslie S. Szivos, Ph.D.
Registration No. 39,394

Scully, Scott, Murphy & Presser
400 Garden City Plaza, Suite 300
Garden City, New York 11530
(516) 742-4343 (phone)
(516) 742-4365 (facsimile)
LSS/MT